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PLANETARY PHENOMENA FOR MARCH AND APRIL, 1896.

BY PROFESSOR MALCOLM MCNEILL.

MARCH.

The vernal equinox, when the Sun crosses the equator from south to north, occurs on March 19th, at about 6 P. M., P. S. T.

Mercury is a morning star throughout the month, and comes to greatest west elongation 27° 20′ on March 5th; but, on account of the fact that it is about ten degrees south of the Sun, the conditions for visibility are not very good. During the first ten days of the month, it rises a little more than an hour before sunrise, and may possibly be seen under good weather conditions.

Venus is still a morning star, but it is overtaking the Sun in its eastward motion among the stars, and, by the end of the month, it rises less than an hour before sunrise. On the morning of March 14th, it passes six minutes south of the fifth magnitude star μ *Capricorni*. The time of nearest approach is about 5 A. M., P. S. T., about the time of its rising in the extreme western part of the United States.

Mars rises about two hours before sunrise throughout the month. During the month it moves about twenty-three degrees eastward and six degrees northward in the constellation *Capricornus*, increasing its apparent distance from the Sun about four degrees. It is coming a little nearer to the Earth in actual distance, but it is still distant from us about twice the mean distance of the Earth from the Sun; and it is gradually growing a little brighter, but the gain is small as yet.

Jupiter is still in fine position for observation, being above the horizon until quite late at night, or, rather, early morning. It is

in the constellation *Cancer*, and, up to March 24th, moves about one degree westward. It then begins to move slowly eastward. It is about five degrees west of the "Beehive" cluster *Præsepe*.

Saturn is gradually getting into favorable position for evening observation, rising at $9^h\ 21^m$ at the end of the month. It is in the constellation *Libra*, and during the month moves about one degree westward and northward. The opening of the rings is quite a little wider than it was last year, the minor axis being more than one-third of the major.

Uranus follows about four degrees after *Saturn*, and three degrees south of it. It is on the borders of the constellations *Libra* and *Scorpio*, and during the month moves about five-tenths of a degree westward.

Neptune is in the eastern part of the constellation *Taurus*, too faint to be seen without a good telescope.

April.

Occultations. The planet *Mars* will be occulted by the Moon on the morning of April 8th. The occultation will be visible in the eastern part of the United States, the planet rising occulted, and coming into view shortly after. The occultation will be over before planet and Moon rise in the western part of the country. On the evening of April 15th, the Moon will again occult the *Pleiades* group, and quite a number of occultations may be seen from almost any part of the country. The Moon is only three days old, and the emersions at the dark limb will be quite striking phenomena. There will be other occultations of the *Pleiades* during the year, in August, October, and November, which can be observed in the United States.

Mercury is a morning star at the beginning of the month, passes superior conjunction on the evening of April 17th, and becomes an evening star. It rapidly increases its apparent distance from the Sun, and, by the end of the month, sets more than an hour and a quarter after sunset; so it may easily be seen under good weather conditions. It will then remain visible on every clear evening for about a month.

Venus is still a morning star, but is drawing nearer the Sun in their apparent eastward motion, and rises only forty minutes earlier at the end of the month. It is in aphelion on April 1st.

Mars is gradually increasing its apparent distance from the Sun, and is rising a little earlier. It is also gaining in brightness,

but will not become conspicuous until late in the summer. It moves twenty-two degrees eastward and eight degrees northward during the month, from the constellation *Capricornus*, through *Aquarius*, and into *Pisces*.

Jupiter is still in fine position in the southwestern sky in the early evening. It does not set until long after midnight. It moves about two degrees eastward in the constellation *Cancer*, toward the "Beehive" cluster.

By the close of the month, *Saturn* rises just after sunset, and is in good position for observation late in the evening at any time during the month. It is in the constellation *Libra*, and during the month it moves about two degrees westward and northward toward α *Librae*, being about three degrees distant on April 30th.

Uranus follows about five degrees after *Saturn*. It is also moving westward, but only about half as fast as *Saturn*.

Neptune is in the eastern part of *Taurus*.

Explanation of the Tables.

The phases of the Moon are given in Pacific Standard time. In the tables for Sun and planets, the second and third columns give the Right Ascension and Declination for Greenwich noon. The fifth column gives the local mean time for transit over the Greenwich meridian. To find the local mean time of transit for any other meridian, the time given in the table must be corrected by adding or subtracting the change per day, multiplied by the fraction whose numerator is the longitude from Greenwich in hours, and whose denominator is 24. This correction is seldom much more than 1^m. To find the standard time for the phenomenon, correct the local mean time by *adding* the difference between standard and local time if the place is west of the standard meridian, and *subtracting* if east. The same rules apply to the fourth and sixth columns, which give the local mean times of rising and setting for the meridian of Greenwich. They are roughly computed for Lat. 40°, with the noon Declination and time of meridian transit, and are intended as only a rough guide. They may be in error by a minute or two for the given latitude, and for latitudes differing much from 40° they may be several minutes out.

PHASES OF THE MOON, P. S. T.

		H. M.
Last Quarter,	Mar. 6,	3 29 A. M.
New Moon,	Mar. 14,	2 48 A. M.
First Quarter,	Mar. 22,	3 57 A. M.
Full Moon,	Mar. 28,	9 21 P. M.

THE SUN.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Mar. 1.	22 52	− 7 16	6 34 A. M.	12 12 P. M.	5 50 P. M.
11.	23 29	− 3 24	6 20	12 10	6 0
21.	0 5	+ 0 33	6 3	12 7	6 11
31.	0 41	+ 4 28	5 47	12 4	6 21

MERCURY.

Mar. 1.	21 8	− 16 15	5 26 A. M.	10 29 A. M.	3 32 P. M.
11.	21 50	− 14 31	5 21	10 31	3 41
21.	22 43	− 10 28	5 21	10 45	4 9
31.	23 43	− 4 20	5 20	11 6	4 52

VENUS.

Mar. 1.	20 43	− 18 19	5 8 A. M.	10 4 A. M.	3 0 P. M.
11.	21 33	− 15 13	5 7	10 14	3 21
21.	22 21	− 11 25	5 2	10 23	3 44
31.	23 7	− 7 5	4 54	10 30	4 6

MARS.

Mar. 1.	20 3	− 21 21	4 41 A. M.	9 24 A. M.	2 7 P. M.
11.	20 35	− 19 45	4 26	9 16	2 6
21.	21 6	− 17 50	4 10	9 8	2 6
31.	21 36	− 15 37	3 53	8 59	2 5

JUPITER.

Mar. 1.	8 9	+ 20 52	2 14 P. M.	9 28 P. M.	4 42 A. M.
11.	8 7	+ 21 0	1 32	8 47	4 2
21.	8 6	+ 21 3	12 51	8 6	3 21
31.	8 6	+ 21 2	12 12	7 27	2 42

Saturn.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Mar. 1.	15 9	− 15 10	11 24 P.M.	4 31 A.M.	9 38 A.M.
11.	15 9	− 15 6	10 44	3 52	9 0
21.	15 8	− 14 59	10 3	3 11	8 19
31.	15 6	− 14 50	9 21	2 30	7 39

Uranus.

Mar. 1.	15 29	− 18 37	11 56 P.M.	4 51 A.M.	9 46 A.M.
11.	15 29	− 18 36	11 16	4 11	9 6
21.	15 28	− 18 34	10 36	3 31	8 26
31.	15 27	− 18 31	9 56	2 51	7 46

Neptune.

Mar. 1.	4 57	+ 21 13	11 2 A.M.	6 16 P.M.	1 30 A.M.
11.	4 57	+ 21 14	10 23	5 37	12 51
21.	4 57	+ 21 15	9 44	4 58	12 12
31.	4 58	+ 21 17	9 4	4 20	11 36 P.M.

Eclipses of *Jupiter's* Satellites, P. S. T.

(Off right-hand limb, as seen in an inverting telescope.)

		H. M.			H. M.
I, R,	Mar. 1.	6 35 P. M.	II, R,	Mar. 20.	3 20 A. M.
III, D,	5.	4 10 A. M.	I, R,	23.	12 20 A. M.
II, R,	5.	10 10 P. M.	II, R,	23.	4 38 P. M.
I, R,	7.	2 0 A. M.	I, R,	24.	6 49 P. M.
I, R,	8.	8 30 P. M.	III, D,	26.	4 9 P. M.
I, R,	10.	2 59 A. M.	III, R,	26.	7 42 P. M.
IV, D,	10.	11 50 P. M.	IV, D,	27.	5 53 P. M.
II, R,	13.	12 45 A. M.	IV, R,	27.	10 33 P. M.
I, R,	15.	10 25 P. M.	I, R,	30.	2 15 A. M.
I, R,	17.	4 54 P. M.	II, R,	30.	7 13 P. M.
III, R,	19.	3 42 P. M.	I, R,	31.	8 44 P. M.

Phases of the Moon, P. S. T.

		H. M.
Last Quarter,	Apr. 4,	4 24 P. M.
New Moon,	Apr. 12,	8 23 P. M.
First Quarter,	Apr. 20,	2 47 P. M.
Full Moon,	Apr. 27,	5 47 A. M.

The Sun.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Apr. 1.	0 45	+ 4 51	5 46 A.M.	12 4 P.M.	6 22 P.M.
11.	1 22	+ 8 37	5 30	12 1	6 32
21.	1 59	+ 12 8	5 15	11 59 A.M.	6 43
May 1.	2 37	+ 15 19	5 2	11 57	6 52

Mercury.

Apr. 1.	23 50	− 3 37	5 20 A.M.	11 8 A.M.	4 56 P.M.
11.	0 57	+ 4 27	5 21	11 36	5 51
21.	2 13	+ 13 26	5 27	12 13 P.M.	6 59
May 1.	3 34	+ 20 58	5 39	12 54	8 9

Venus.

Apr. 1.	23 12	− 6 38	4 54 A.M.	10 30 A.M.	4 6 P.M.
11.	23 57	− 1 58	4 43	10 36	4 29
21.	0 42	+ 2 51	4 32	10 42	4 52
May 1.	1 28	+ 7 35	4 22	10 48	5 14

Mars.

Apr. 1.	21 39	− 15 22	3 51 A.M.	8 58 A.M.	2 5 P.M.
11.	22 9	− 12 54	3 33	8 48	2 3
21.	22 38	− 10 13	3 13	8 38	2 3
May 1.	23 6	− 7 24	2 52	8 27	2 2

Jupiter.

Apr. 1.	8 6	+ 21 2	12 8 P.M.	7 23 P.M.	2 38 A.M.
11.	8 8	+ 20 57	11 31 A.M.	6 46	2 1
21.	8 10	+ 20 48	10 55	6 9	1 23
May 1.	8 14	+ 20 35	10 21	5 34	12 47

Saturn.

Apr. 1.	15 6	− 14 49	9 17 P.M.	2 26 A.M.	7 35 A.M.
11.	15 3	− 14 38	8 34	1 44	6 54
21.	15 1	− 14 26	7 52	1 2	6 12
May 1.	14 58	− 14 14	7 9	12 20	5 31

URANUS.

1896.	R. A. H. M.	Declination. ° ′	Rises. H. M.	Transits. H. M.	Sets. H. M.
Apr. 1.	15 27	− 18 30	9 52 P.M.	2 47 A.M.	7 42 A.M.
11.	15 26	− 18 26	9 11	2 6	7 1
21.	15 24	− 18 21	8 30	1 26	6 22
May 1.	15 23	− 18 15	7 49	12 45	5 41

NEPTUNE.

Apr. 1.	4 58	+ 21 17	9 0 A.M.	4 16 P.M.	11 34 P.M.
11.	4 59	+ 21 19	8 22	3 38	10 54
21.	5 0	+ 21 21	7 44	3 0	10 16
May 1.	5 2	+ 21 23	7 6	2 23	9 40

ECLIPSES OF *JUPITER'S* SATELLITES, P. S. T.

(Off right-hand limb, as seen in an inverting telescope.)

	H. M.		H. M.
III, D, Apr. 2.	8 9 P. M.	II, R, Apr. 14.	12 23 A. M.
III, R, 2.	11 41 P. M.	I, R, 15.	12 35 A. M.
II, R, 6.	9 48 P. M.	I, R, 16.	7 4 P. M.
I, R, 7.	10 40 P. M.	II, R, 21.	2 58 A. M.
I, R, 9.	5 9 P. M.	I, R, 22.	2 31 A. M.
III, D, 10.	12 9 A. M.	I, R, 23.	8 59 P. M.
IV, R, 13.	4 39 P. M.	I, R, 30.	10 55 P. M.

THE PHOTOGRAPHY OF PLANETOIDS, BY PROFESSOR MAX WOLF.

ABSTRACT BY DR. EDWARD S. HOLDEN.

The *Astronomische Nachrichten* No. 3319 contains an exhaustive paper by Professor MAX WOLF, of Heidelberg, on the photography of planetoids, based on his personal experience in the years 1891–1895. His work has been done with portrait lenses of five and of six inches aperture, with foci of twenty-five and of thirty inches, respectively. The lens is kept accurately pointed for exposures of one and one-half, or, better, two hours, and the stars appear as *dots* on the plate, while asteroids are distinguished by their (short) *trails*.

To draw safe conclusions from such observations, the plates must be in duplicate. If both plates are simultaneously exposed,